



US006229481B1

(12) **United States Patent**
Katz(10) **Patent No.:** **US 6,229,481 B1**(45) **Date of Patent:** **May 8, 2001**(54) **METHOD OF IMPROVING QUALITY OF RADIO CONNECTION**(75) **Inventor:** **Marcos Katz, Oulu (FI)**(73) **Assignee:** **Nokia Telecommunications Oy, Espoo (FI)**(*) **Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.(21) **Appl. No.:** **09/341,095**(22) **PCT Filed:** **Nov. 4, 1998**(86) **PCT No.:** **PCT/FI98/00855**§ 371 Date: **Oct. 19, 1999**§ 102(e) Date: **Oct. 19, 1999**(87) **PCT Pub. No.:** **WO99/25142****PCT Pub. Date:** **May 20, 1999**(30) **Foreign Application Priority Data**Nov. 5, 1997 (FI) 974149
Mar. 19, 1998 (FI) 980616(51) **Int. Cl.⁷** **H04B 7/00**(52) **U.S. Cl.** **342/367; 455/25; 455/562**(58) **Field of Search** **342/367, 372; 455/562, 25, 517**(56) **References Cited****U.S. PATENT DOCUMENTS**5,861,844 1/1999 Gilmore et al. 342/374
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Primary Examiner—Gregory C. Issing(74) **Attorney, Agent, or Firm**—Pillsbury Winthrop LLP(57) **ABSTRACT**

The invention relates to a method of improving the quality of a radio connection (170) in a cellular radio network. Relevant for the invention, the cellular radio network includes a base station system (126) and a subscriber terminal (150). A bi-directional radio connection (170) using a directional antenna beam (304) is provided between the base station system (126) and the subscriber terminal (150). In the method, in the base station system (126) an angle of incidence (302) of the directional antenna beam (304) is formed on the basis of a received radio signal (170A) transmitted by the subscriber terminal (150). The base station system (126) transmits a radio signal (170B) to the subscriber terminal (150) in the direction of an angle of departure (308) formed on the basis of the angle of incidence (302). In accordance with the invention, a ratio is formed for the imbalance between the downlink and uplink traffics. The processing of the directional antenna beam (304) of the radio signal (170A, 170B) is controlled on the basis of the formed ratio.

angle
formed
by beam**48 Claims, 5 Drawing Sheets**